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On some avifauna from Jojari River – A Wastewater Wetland in Semi-Urban Area of Jodhpur City, Rajasthan

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Abstract

A field survey was carried out in the Jojari River, a wastewater wetland in Jodhpur city of Rajasthan state for a period from December 2015 and February 2016 with the objective of documenting avifaunal diversity of the wastewater wetland. A total of 40 species of birds belonging to 11 orders under 17 families have been recorded. Most of the birds recorded were winter migrants and some of them belonging to the threatened categories deserve better protection.

Keywords: Aves, Conservation, Jodhpur, Jojari River, Wastewater Wetland

Introduction

Wetlands are often acted as sink for sewages and urban waste that turn it to be a wastewater wetland. Approximately 4.9% land mass of India is designated as wetland of one or more category. Wetlands are the most fertile and productive ecosystems and important breeding and nursery grounds for fishes, birds and other animals. Nevertheless, wastewater wetlands are as important as natural wetlands. Being a dumping ground of anthropogenic discharge, these wetlands resulted in a unique ecosystem by eutrophication and thereby support increasing biomass of phytoplankton, gelatinous zooplankton, benthic and epiphytic algae.This unique ecosystem also supports immense diversity of microbes, hardy fish species, crustaceans and mollusks that allure fauna especially birds which feed upon them. Bird abundance and species richness is high on eutrophic lakes because of greater food resources (Hoyer & Canfield, 1994).

Luni River flows in the western part of India in the state of Rajasthan. It is a major river of the area and main source of irrigation. The tributaries *viz.* Jowai, Sukri and Jojari River originated from Luni (Khan & Mathur, 2015). Originating from the hillocks near Pondlu village, Jojari River flows from northeast in Nagaur district, enters Barmer district and empties into the Luni River in the southwest of Jodhpur district (Rawat & Jakher, 2005). Rajasthan's second-largest city Jodhpur, with a population of over 1.2 million, is known for its numerous textile dyeing, steel polishing, handicraft, printing, Guar gum and re-rolling industries. The effluents, whether treated or untreated discharged from the industries and households, are being dumped into the Jojari River. This paper discusses the avian diversity of such a wastewater wetland present in Jodhpur of Rajasthan.

Material and Methods

Jodhpur city in Rajasthan (Lat 26.258270° and Long 73.016988°) encompasses an area of 22,850 sq. km and covers 11.60% of the total arid zone area (Khan & Mathur, 2015). The Jojari River (Lat 26.201153° and Long 73.057197°) having a total catchment area of its river basin is 1453 km^2 out of which 917 km^2 falls within Jodhpur district (Rawat & Jakher, 2005). It is a seasonal river with very little to no water in the dry months. Occasionally, this river gets excess water from the rains and rarely gets flooded. Present study focused on the congregation of avian diversity in this wastewater wetland in Jodhpur district through direct observations during field visit and attempted for a comprehensive listing of bird species visiting this unique habitat (Figure 1).

A visit to the Jojari River was made from December 2015 to February 2016 to collect data on avifauna. Observations were made mainly at 5 locations (Table 1) by walking through the trails around each study locations from 7 am to 10 am in the morning and 3 pm to 6 pm in

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Figure 1. Location of Jojari River in Jodhpur city of Rajasthan.

Table 1. Details of study locations of Jojari River, Jodhpur, Rajasthan

Sl. No.	Site	Latitude (N)	Longitude (E)	Altitude (meters)
1.	Site 1	26.216341°	26.216341°	198m
2.	Site 2	26.244126°	73.090634°	201m
3.	Site 3	26.193397°	73.050026°	195m
4.	Site 4	26.233126°	73.074706°	200m
5.	Site 5	26.204517°	73.059974°	196m

the evening. Birds were sighted using binocular (Olympus 50×10) and photographs of birds were taken using Canon SX 60 HS powershot digital camera and later identified using the standard field guide (Grimmett *et al.*, 2011). Sighting location was recorded with a handheld GPS (Garmin inc.) (Table 1).

Results

During the study period a total of 40 species of birds belonging to 11 orders under 17 families were documented from the Jojari River wetland among which order Charadriiformes was found to be the highest following Anseriformes, Ciconiiformes, Pelecaniformes, Coraciiformes,Gruiformes,Passeriformes,Accipitriformes, Phoenicopteriformes, Podicipediformes and Suliformes respectively. All species are included in the schedule IV of the Wildlife (Protection) Act, 1972. The present study listed 35 species of birds which are under Least Concern category, three species under Near Threatened and one species under Vulnerable category of IUCN Red List (ver 3.1). Among the recorded bird species, most were winter migrant. Omnivorous bird species were found in large number (55%) following carnivorous (43%) and insectivorous (2%) bird species (Table 2), (Figure 2).

Discussion

Pollution is the major reason that is affecting the bird population of Jojarai River. The effluents discharged into the Jojari River contains chemical pollutants like carbonates, bicarbonates, nitrates, phosphates and toxic metals in addition to the suspended solids (Rawat & Jakher, 2005) which causes eutrophication. Presence of

Table 2. List of birds found in Jojari River with their IWLPA and IUCN status along with food habit and migratory status.

Sl no.	Order	Family	Bird species (Scientific name)	Common Name	IWLPA, 1972	IUCN Status	Food Habit	Migratory status
1	Accipitriformes	Accipitridae	*Circus aeruginosus* (Linnaeus, 1758)	Western Marsh Harrier	IV	LC	C	WM
2	Anseriformes	Anatidae	*Anas acuta* Linnaeus, 1758	Northern Pintail	IV	LC	O	WM
3	Anseriformes	Anatidae	*Anas clypeata* Linnaeus, 1758	Northern Shoveller	IV	LC	O	WM
4	Anseriformes	Anatidae	*Anas poecilorhyncha* (J.R. Forester, 1781)	Indian Spot-billed Duck	IV	LC	O	R
5	Anseriformes	Anatidae	*Anser indicus* (Latham, 1790)	Bar-headed Goose	IV	LC	O	WM
6	Anseriformes	Anatidae	*Dendrocygna javanica* (Horsfield, 1821)	Lesser Whistling-Duck	IV	LC	C	R
7	Anseriformes	Anatidae	*Tadorna ferruginea* (Pallas, 1764)	Ruddy Shelduck	IV	LC	O	WM
8	Charadriiformes	Burhinidae	*Burhinus oedicnemus* (Linnaeus, 1758)	Eurasian Thick-knee	IV	LC	C	R
11	Charadriiformes	Charadriidae	*Charadrius alexandrinus* (Linnaeus, 1758)	Kentish Plover	IV	LC	O	R
12	Charadriiformes	Charadriidae	*Charadrius dubius* (Scopoli, 1786)	Little Ringed Plover	IV	LC	C	R
20	Charadriiformes	Charadriidae	*Vanellus indicus* (Boddaert, 1783)	Red-wattled Lapwing	IV	LC	C	R
21	Ciconiiformes	Charadriidae	*Charadrius hiaticula* (Linnaeus, 1758)	Common Ringed Plover	IV	LC	O	IR
17	Charadriiformes	Laridae	*Sterna aurantia* Gray, 1831	River Tern	IV	NT	C	R
13	Charadriiformes	Recurvirostridae	*Himantopus himantopus* (Linnaeus, 1758)	Black-winged Stilt	IV	LC	O	R
16	Charadriiformes	Recurvirostridae	*Recurvirostra avosetta* (Linnaeus, 1758)	Pied Avocet	IV	LC	O	WM
9	Charadriiformes	Scolopacidae	*Calidris minuta* (Leisler, 1812)	Little Stint	IV	LC	O	WM
10	Charadriiformes	Scolopacidae	*Calidris temminckii* (Leisler, 1812)	Temminck's Stint	IV	LC	O	WM
14	Charadriiformes	Scolopacidae	*Limicola falcinellus* (Pontoppidan, 1763)	Broad-billed Sandpiper	IV	LC	C	WM
15	Charadriiformes	Scolopacidae	*Philomachus pugnax* (Linnaeus, 1758)	Ruff	IV	LC	C	WM
18	Charadriiformes	Scolopacidae	*Tringa glareola* Linnaeus, 1758	Wood Sandpiper	IV	LC	O	WM
19	Charadriiformes	Scolopacidae	*Tringa totanus* (Linnaeus, 1758)	Common Redshank	IV	LC	C	WM
22	Ciconiiformes	Ciconiidae	*Ciconia episcopus* (Boddaert, 1783)	Asian Woolly-necked Stork	IV	VU	C	R

Table 2. Continued...

Sl no.	Order	Family	Bird species (Scientific name)	Common Name	IWLPA, 1972	IUCN Status	Food Habit	Migratory status
24	Ciconiiformes	Ciconiidae	*Mycteria leucocephala* (Pennant, 1769)	Painted Stork	IV	NT	O	R
23	Ciconiiformes	Scolopacidae	*Limosa limosa* (Linnaeus, 1758)	Black-tailed Godwit	IV	NT	O	WM
25	Coraciiformes	Alcedinidae	*Ceryl erudis* (Linnaeus, 1758)	Pied Kingfisher	IV	LC	O	R
26	Coraciiformes	Alcedinidae	*Halcyon smyrnensis* (Linnaeus, 1758)	White-breasted Kingfisher	IV	LC	O	R
27	Coraciiformes	Meropidae	*Merops orientalis* (Latham, 1802)	Green Bee-eater	IV	LC	O	R
28	Gruiformes	Rallidae	*Amaurornis phoenicurus* (Pennant, 1769)	White-breasted Waterhen	IV	LC	O	R
29	Gruiformes	Rallidae	*Fulica atra* (Linnaeus, 1758)	Eurasian Coot	IV	LC	O	R
30	Gruiformes	Rallidae	*Gallinula chloropus* (Linnaeus, 1758)	Common Moor-hen	IV	LC	O	R
31	Passeriformes	Dicruridae	*Dicrurus macrocercus* (Vieillot, 1817)	Black Drongo	IV	LC	C	R
32	Passeriformes	Motacillidae	*Motacilla flava* (Linnaeus, 1758)	Western Yellow Wagtail	IV	LC	C	WM
33	Passeriformes	Motacillidae	*Motacilla madaraspatensis* (J. F. Gmelin, 1789)	White-browed Wagtail	IV	NE	C	R
34	Pelecaniformes	Ardeidae	*Ardea alba* (Linnaeus, 1758)	Great Egret	IV	LC	C	R
35	Pelecaniformes	Ardeidae	*Ardea cinerea* (Linnaeus, 1758)	Grey Heron	IV	LC	O	R
36	Pelecaniformes	Ardeidae	*Ardeola grayii* (Sykes, 1832)	Indian Pond Heron	IV	LC	C	R
37	Pelecaniformes	Ardeidae	*Bubulcus ibis* (Linnaeus, 1758)	Cattle Egret	IV	LC	O	R
38	Phoenicop-teri-formes	Phoenicopte-ridae	*Phoenicopterus roseus* (Linnaeus, 1758)	Greater Fla-mingo	IV	LC	C	WM
39	Podicipediformes	Podicipedidae	*Tachybaptus ruficollis* (Pallas, 1764)	Little Grebe	IV	LC	C	R
40	Suliformes	Phalacro-coracidae	*Phalacrocorax niger* (Vieillot, 1817)	Little Cormo-rant	IV	LC	I	R

IWLPA, 1972 = Indian Wildlife Protection Act, 1972; IUCN status – LC: Least Concern; NT: Near Threatened; VU: Vulnerable; NE: Not Evaluated; Food Habit – C: Carnivorous; I: Insectivorous; O: Omnivorous; Migratory status – R: Resident; WM: Winter Migrant; IR: Isolated Record.

aquatic birds such as Grebes indicate the high level of eutrophication (Rutschke, 1987) and is evident in the Jojari River. Due to eutrophic condition, the river is very rich in planktonic (Phytoplankton & zooplankton) mass (Rawat & Jakher, 2005). Increase level of phytoplankton will cause decrease level of dissolved oxygen in water which results in hypoxic condition of Jojari River causing depletion of faunal diversity. Besides, anaerobic condition of the Jojari River may further promote growth of bacteria such as *Clostridium botulinum* that produces toxins deadly to

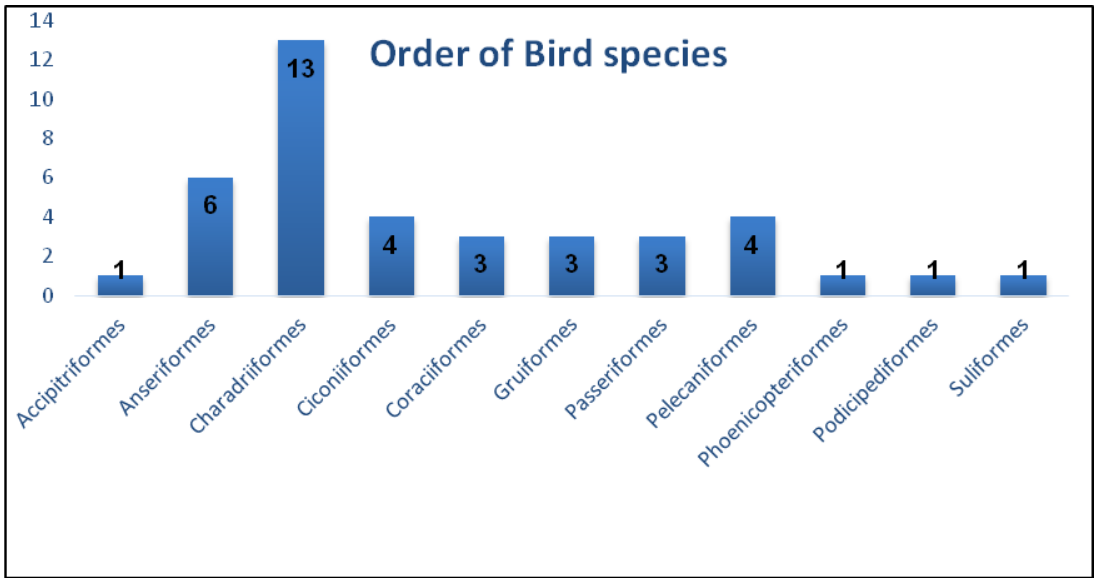

Figure 2. Number of order of bird species found in Jojari River, Rajasthan.

birds and mammals. Wastewater produced from various industries of Jodhpur city contain pollutants (Khan & Mathur, 2015) and presence of bird species like Spot-billed Duck and Blacked-winged Stilt in Jojari River indicate polluted wetland. Pollution level could alter the species composition and community structure of Zooplankton species (Chandrasekhar, 2010) in Jojari River which will further affect abundance of bird species (Patra *et al.,* 2010). In addition, trophic level of the Jojari River can be affected by pollutants which may further influence bird species abundance and richness as evident in other such lakes (Murphy *et al.*, 1984; Brown & Dinsmore 1986). Hence measures must be taken to avoid such situation. Though further increase in pollution must be avoided, but sudden intervention in the existing system must not be taken without deep understanding of the system. In general, when a water body, even after having pollution, still attracts water birds, that signify within the system there are some elements, which are naturally taking care of the pollution factor.

Apart from pollution, the other factor which can affect bird population is reduced flow of this river. Illegal encroachment, unwanted stone/sand removal from the river can cause obstruction and reduction of water flow.

Winter season in Rajasthan lure numerous migratory bird species which come from far-off places providing required resting, roosting, feeding and breeding ground to the birds. The state serves as a halting place for numerous migratory species and thus exhibit rich avian biodiversity. In India, general time of arrival in case of winter migrants varied a lot. A group of them arrive quite early, during end of September some time, but in general, they always arrive by early November. Again some groups start flying back as early as end of January, but almost all of them departs by end of March. The resident bird also keep moving within the geographic area of India, in different times, for places they are also known as local migrants, as some time during winter they congregate in certain water bodies in huge number starting from a few hundred to several thousand even. A good example of this is the Lesser Whistling-duck. Presence of as many as 15 migratory birds out of 40 species recorded, as well as 24 residential birds in Jojari River itself is an indicator of importance of this wastewater wetland as a refuge and feeding ground for afore listed winter migrants.

Therefore, effluents coming from industries and sewage need to be treated before discharge into the Jojari River and can be used for fisheries and agricultural practices like East Calcutta Wetland in Kolkata, where city sewage is being treated and used in fisheries and agricultural practices. Except, Rawat & Jakher (2005) who studied biology and ecology of Jojari River and Khan & Mathur (2015) who studied impact of textile effluents on Jojari River, no work has been done on avifaunal diversity of Jojari River so far. Considering the lack of information

from such an important landscape of desert ecosystem of Jodhpur, the present work forms first effort to document avian faunal diversity in this wastewater wetland. Long-term studies need to be carried out to assess the impact as well as documentation of interesting fauna from Jojari river wastewater wetland for future conservation and management strategies.

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